Title **Soil classification, map legends and GIS logic: experiences from converting the legend of the soil map of Belgium into WRB**[♣]

Authors

Stefaan Dondeyne[1], Xavier Legrain[2], Carole Ampe[3], Nathalie Cools[4], Karen Vancampenhout[5], Geert Baert[6], Roger Langohr[7], Eric Van Ranst[7] and Jozef Deckers[1]

Affiliations

[1] Department Earth and Environmental Sciences, Leuven University, Leuven, Belgium
[2] Soil Science Unit, Gembloux Agro-Bio Tech, University of Liège, Gembloux, Belgium
[3] Flemish Land Agency (VLM), Brugge, Belgium
[4] Research Institute for Forest and Nature, Geraardsbergen, Belgium
[5] Cluster for Bioengineering Technology, Leuven University, Campus Geel, Belgium
[6] Faculty of Bio-engineering, University College Ghent, Gent, Belgium
[7] Laboratory of Soil Science, Ghent University, Gent, Belgium

Corresponding and presenting author

S. Dondeyne email Stefaan_Dondeyne@yahoo.co.uk

Abstract

A systematic soil survey of Belgium was conducted from 1948 to 1991. The purpose was to have a soil information base adequate for boosting agricultural production after the Second World War. Field surveys were done at the detailed scale of 1:5000, while the maps were published at a 1:20,000 scale. To enable soil surveyors to identify soils in the field, an original soil classification was developed based on readily observable physical and morphogenetic characteristics. Within the European Union, the World Reference Base (WRB) for Soil Resources (IUSS Working Group WRB, 2007), has been adopted as the common classification system. As soil surveys in most European countries were conducted independently, the challenge now is to convert the national legends into a common WRB legend. In Belgium, such a conversion is being implemented and we present some lessons learned in relation to classification and map legends.

The legend of the soil map of Belgium is based primarily on soil texture, drainage status and profile development. "Soil series" are defined in an open and non-hierarchical structure by combining these three categorical variables, and to which modifiers can be added such as parent material, stoniness or depth to a substratum. The WRB-2007

[♣] Prepared for the IUSS conference "Soils in Space and Time", Ulm, Germany, 30th Sep-5th Oct 2013

classification is based on diagnostic features defined by morphological, physical and chemical properties. The conversion of the legend of the soil map of Belgium to WRB is based on insights gained from classifying, so far, more than 360 legacy soil profiles in combination with field observations. From these insights, heuristic rules have been deduced regrouping soil series into Reference Soil Groups (RSG) and for which some qualifiers could also be identified. Other qualifiers were determined by relying on databases of the legacy soil profiles. To take regional variability into account, the conversion is done by physiographic zone.

Converting the legend of the soil map of Belgium to WRB actually leads to a regrouping of soil series into broader WRB categories and which can neatly be represented on 1:50,000 scale maps. Hence, it does not imply substituting one classification with another one. Users, who would need the detailed information, can still refer to the detailed symbols of the soil series. The regrouping of soil series has been made possible thanks to the flexibility of WRB for combining various qualifiers. However, as the WRB-2007 classification leads to a varying number of qualifiers it is less practical for constructing map legends (Table 1). Therefore, the WRB-2010 guidelines (IUSS Working Group WRB, 2010) propose to organise qualifiers in main and optional ones with priority rules for the main qualifiers. As illustrated in Table 1, this approach may highlight, or hide, some qualifiers inconsistently. When for example only two qualifiers are retained in a map legend, the qualifier Endogleyic of stony, poorly drained *Albic Podzols* will not be indicated, while it will be indicated when such soils are not stony (Table 1). Moreover, the proposed hierarchy is sometimes also inconsistent when compared across Reference Soil Groups (RSG) as illustrated for the Arenosols and Regosols (Table 1). These drawbacks could be avoided if qualifiers would be organised into thematic groups — such as profile development, texture, drainage, depth of substratum and fertility — rather than by ranking them. Grouping qualifiers thematically would have the advantage to give more flexibility to the map user working with GIS, and indeed, it would render WRB a more "GIS logic" classification system.

Bibliography

Dondeyne S., E Van Ranst, S. Deckers (2013) - *The soil map of the Flemish region converted to a World Reference Base legend: the inland regions*. KU Leuven, Universititeit Gent, Administratie van de Vlaamse Regering, Brussels

Dondeyne S., E Van Ranst, S. Deckers, et al. (2012) - Converting the legend of the Soil Map of Belgium into the World Reference Base for Soil Resources: case studies from the Flemish region. KU Leuven, Universititeit Gent, Administratie van de Vlaamse Regering, Brussels, incl. 3 maps.

Table 1 – Example of organisation of WRB qualifiers according to the principles of the WRB-2007 classification and the WRB-2010 guidelines for map legends. The latter has the advantage of allowing to easily represent various degrees of detail in a mapping legend; the disadvantage is that the data are not stored according to thematic fields

		WRB-2007 classification		WRB-2010 Legend			
Soil series	**RSG**	**Prefix qualifiers**	**Suffix qualifiers**	**Main qualifier-1**	**Main qualifier-2**	**Main qualifier-3**	**Optional qualifier**
Zbg	Podzols	Albic	*Arenic	Albic			Arenic
Zbgt	Podzols	Hyposkeletic Albic	*Arenic	Albic	Hyposkeletic	-	Arenic
Zdg	Podzols	Endogleyic Albic	*Arenic	Albic	Endogleyic	-	Arenic
Zdgt	Podzols	Endogleyic Hyposkeletic Albic	*Arenic	Albic	Hyposkeletic	Endogleyic	Arenic
(w)Zcc	Arenosols	Brunic	Dystric, *Bathyabruptic	Brunic	Dystric	-	Arenic
wZcc	Regosols	Haplic	Brunic, Dystric, Endoabruptic	Dystric	Brunic		Endoabruptic

* qualifiers not foreseen as standard in the particular Reference Soil Groups (RSG)